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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/054,810	01/22/2002	Ralf Senner	8540G0059DVA	8972

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EXAMINER	
ALEJANDRO, RAYMOND	
ART UNIT	**PAPER NUMBER**
1745	

DATE MAILED: 09/02/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/054,810	SENNER, RALF	
	Examiner	Art Unit	
	Raymond Alejandro	1745	

-- The MAILING DATE of this c mmunication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *22 January 2002* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *27-43* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *27-43* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *22 January 2002* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *3* .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

Priority

1. Applicant's claim for domestic priority under 35 U.S.C. 120 is acknowledged. This application claims subject matter disclosed in prior Application No. 09/416583, filed 10/12/99. However, it is noted that a reference to the prior application *must be inserted as the first sentence of the specification of this application or in an application data sheet* (37 CFR 1.76), if applicant intends to rely on the filing date of the prior application under 35 U.S.C. 119(e) or 120. See 37 CFR 1.78(a). For benefit claims under 35 U.S.C. 120, *the reference must include the relationship* (i.e., continuation, divisional, or continuation-in-part) of all nonprovisional applications. Also, *the current status* of all nonprovisional parent applications referenced should be included.

Information Disclosure Statement

2. The information disclosure statement (IDS) submitted on 01/22/02 (paper # 3) was considered by the examiner.

Drawings

3. The sheets of drawings filed on 01/22/02 have been accepted.

Specification

4. The disclosure is objected to because of the following informalities: it is noted that throughout the entire specification the applicant makes reference to certain US patent applications by their serial numbers only (for example, see pages 1, 3-4, 14 and 20), nevertheless

the current status of all nonprovisional parent applications referenced should be included.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 27-43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kennard, III et al 5472580 in view of Grot et al 6001499.

The instant claims are directed to methods for monitoring gases wherein the disclosed inventive concept comprises the particular steps therein.

Kennard, III et al disclose a sensor downstream from a converter (col 2, line 38-40); the sensor include an inner electrode which may be platinum (active surface) formed on an electrolyte body and an outer electrode including gold containing layer (active surface) formed on an opposed surface therein (col 2, lines 53-58). Figure 2 depicts the sensor comprising a housing (container) along a conduit receiving a stream. Some of the primary components present in the combustion product are hydrogen and carbon monoxide (col 3, lines 32-34). *Thus, the sensor may be employed for monitoring both substances.*

It is disclosed that a voltage output from the sensor could be defined. The exact specification for a particular sensor application would vary depending on the sensors temperature, electrode alloy, operating unit and point and desired performance of the converter.

An output is sent from the comparator to signal the operator, such signal may activate a warning light, gauge or other display means (col 3, lines 5-15). The sensor performance, accuracy and reliability can be greatly improved by operating in specific air to fuel ratio ranges and temperature ranges (col 4, lines 61-65).

Figure 4 illustrated the voltage output of a typical sensor. Figure 5 illustrates the sensitivity of a typical sensor to hydrogen concentration in the gas. Figure 7 illustrates the sensitivity of a typical sensor to concentration of carbon monoxide in the gas. In Figure 8, the voltage output of the sensor is plotted for several conversion efficiency levels and as a function of the temperature. In Figure 3, the sensor output voltage in the fuel cell lean region shows a distinct relation to conversion efficiency. The sensor is able to diagnose the efficiency and useful life of a converter by measuring the exhaust leaving the reactor (converter) with the sensor (col 4, lines 45-49). *Because the voltage output has been determined as a function of conversion efficiency levels, the current produced by the reaction at the reactive surface may be determined by a simple mathematical correlation employing Ohm's Law as well. Thus, it's an implicit teaching.*

The method for monitoring the gases is inherent as it necessarily flows from the teachings of the apparatus.

Kennard, III et al disclose sensor for monitoring gases according to the foregoing. However, Kennard, III et al do not explicitly disclose the regulator, the gas stream connections, the particular of the additional cells, the polymer membrane, the gas diffusion layer, the look up table.

Grot et al disclose a carbon monoxide sensor communicating with the hydrogen feed manifold for sensing the concentration therein, the sensor comprises a gas monitoring PEM-probe including a proton exchange membrane having an anode and a cathode affixed therein such that the anode from the PEM-probe is exposed to the hydrogen (col 14, lines 45-64). *Grot et al disclose that the PEM is essentially a mini PEM fuel cell which, like the stack's cells, has an anode and a cathode affixed; and a hydrogen flow channel* (col 3, lines 52-55). *Consequently, the mini PEM fuel cell should contain more than one fuel cell (electrochemical cell) in its stack.* The PEM-probe's anode has a smaller area and a lower catalyst loading than the stack's cell (col 3, lines 57-60).

Grot et al further disclose that the sensor also includes first and second current collector, and electrical discharge circuit having a first electrical resistance valued for discharging the PEM probe at a rate selected to monitor the degrading output of the PEM probe incident to the gas contamination of the anode; and an electrical purging circuit adapted to raise the potential of the anode from the PEM-probe sufficiently to effect electrochemical oxidation of the gas; and an electrical switch to alternately connect the contacts to the discharge and purging circuit (col 14, lines 45-64). The sensor which monitors real time concentration is used as a mean to control the operation of a fuel cell system (col 3, lines 27-30).

Grot et al disclose that the output signal behavior pattern is compared to certain telltale outputs from a reference PEM probe identical to the gas monitoring PEM-probe which have been correlated to known concentrations. Conventional pattern recognition technology is preferred for reliably comparing the PEM-probe's output to the telltale output e.g. approximate slope of voltage degradation curve (col 7, lines 40-53).

In view of the above, the invention as a whole would have been obvious to one skilled in the art as by integrating the gas sensor teachings of Grot et al in the sensor of Kennard, III et al the performance, accuracy and reliability of the sensor is greatly improved for operating either in dynamic or static conditions strictly related to parameter measurements from the gas monitoring device. Regulating and controlling those parameters by using reliable and consistent-to-operation acquired data and programming to perform a comparison process from voltage and current values enhance real time data which may be tabulated to create a behavior pattern affecting the overall unit operation e.g. a fuel cell.

As to the additional cells, it would be obvious to make the gas sensor of Kennard, III et al containing additional cells as Grot et al teach the PEM is essentially a mini PEM fuel cell like the stack's cells. Hence, by adding more fuel cell (electrochemical cell) to the gas sensor itself, the capacity and reliability for determining gas concentration is enhanced. More fuel cells increase the amount of gas samples which can be chemically analyzed; and allow the gas stream to be diverted so as to provide a configuration capable of performing multifunction test analysis which are necessary for maintaining a suitable inlet and exhaust stream concentration in the attached device. For the same reasons mentioned above, it would be obvious to use a polymer membrane and a gas diffusion layer in the sensor of Kennard, III et al as Grot et al PEM-probe contains a polymer membrane separating the cathode and the anode and catalyst layer. These elements have been conventionally used as suitable members fitting into the required implementation and execution for these chemical and mechanical purposes.

Moreover, the chemical system in which both gas monitoring/sensor device are employed is similar, therefore there is a significant expectation that both devices are interchangeable or

compatible to each other with respect to the chemical environment as well as the standard function intended for them.

Conclusion

3. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Raymond Alejandro whose telephone number is (703) 306-3326. The examiner can normally be reached on Monday-Thursday (8:30 am - 7:00 pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick J. Ryan can be reached on (703) 308-2383. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

Raymond Alejandro
Examiner
Art Unit 1745